

Using Gaia as an Astrometric Tool for Deep Ground-based Surveys

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ABSTRACT

Gaia DR1 positions are used to astrometrically calibrate three epochs' worth of Subaru SuprimeCam images in the fields of globular cluster NGC 2419 and the Sextans dSph. Distortion-correction "maps" are constructed from a combination of offset dithers and reference to Gaia DR1. These are used to derive the absolute proper motion of NGC 2419. This project demonstrates the feasibility of combining Gaia with deep, ground-based surveys, thus extending high-quality astrometry to magnitudes beyond the limits of Gaia.

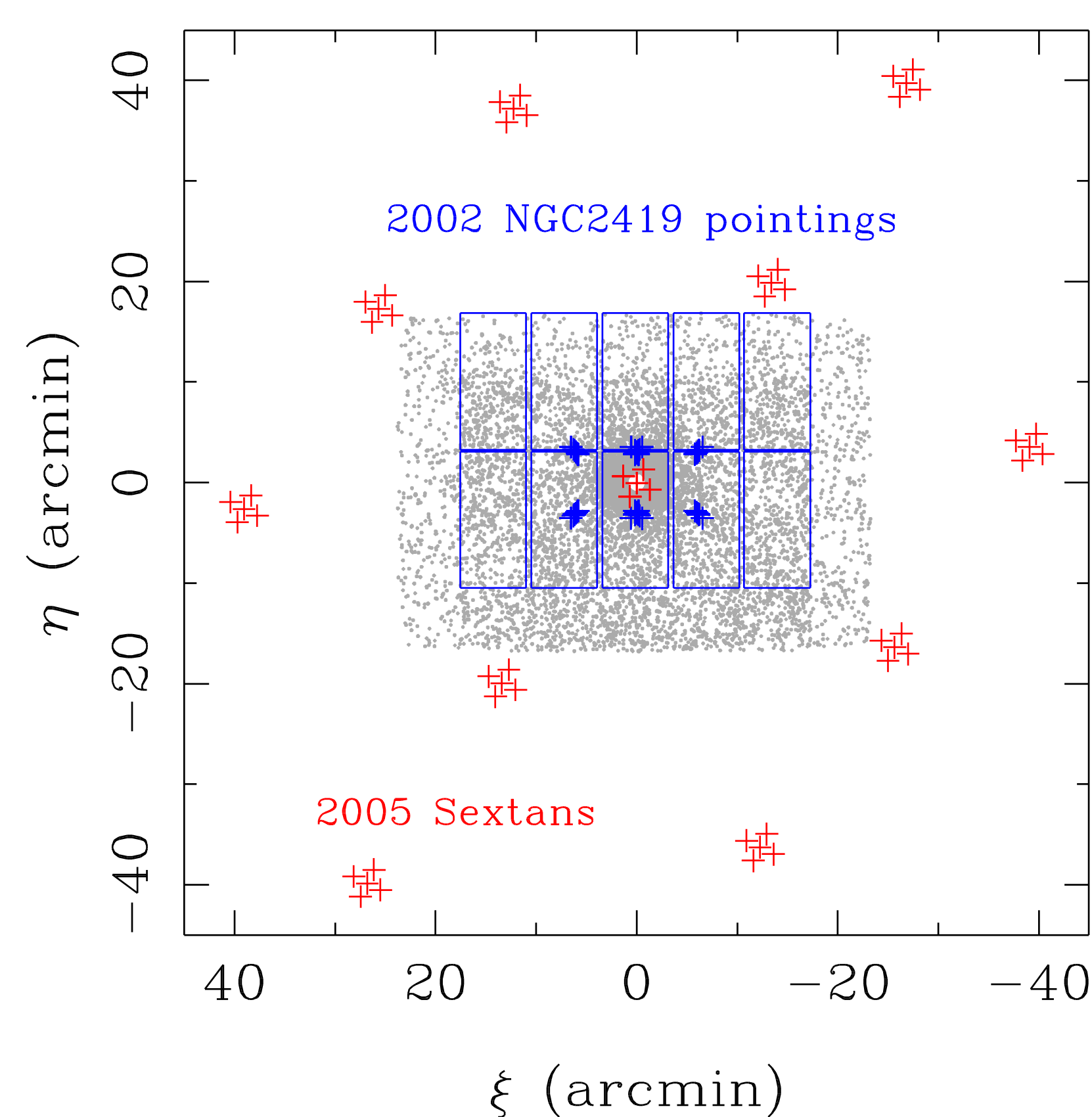


image credit: H. Fujiwara & NAOJ

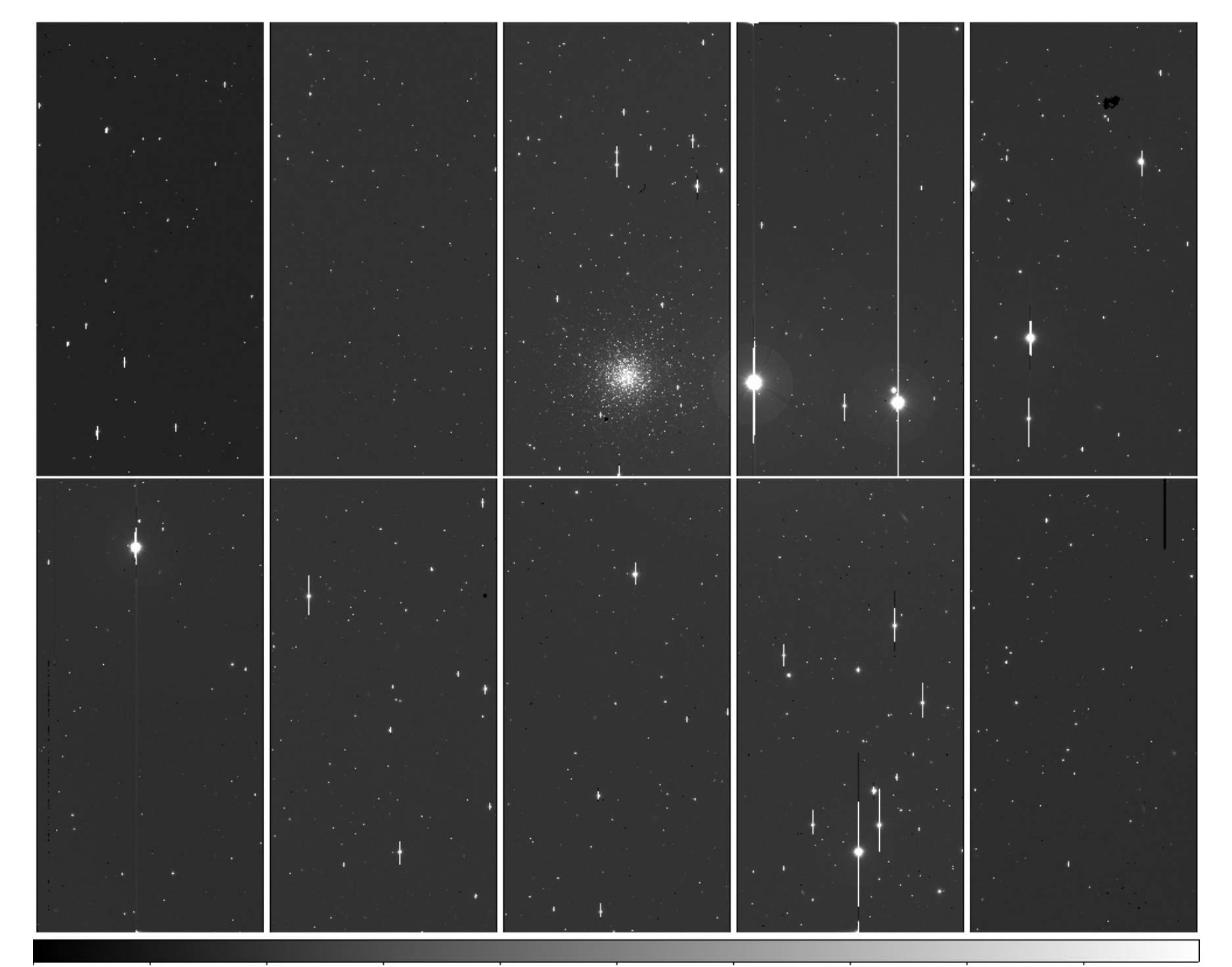
Observational & Astrometric Data

	NGC 2419	Sextans
Epochs of SuprimeCam data / No. of images used	2002 / 207 2005 / 48 2012 / 22	2005 / 62 2012 / 20
Gaia DR1	2015	2015

SuprimeCam images covering three epochs were downloaded from the Subaru Telescope data archive. The first two epochs consist of V-filter, 15 to 360-sec exposures. The 2012 data are Strömrgren b and y, with exposures of 18 to 360 sec. [Note that the camera underwent a major upgrade during 2008.] Gaia DR1 positions for the two fields of study were extracted from the web-based Gaia archive facility.

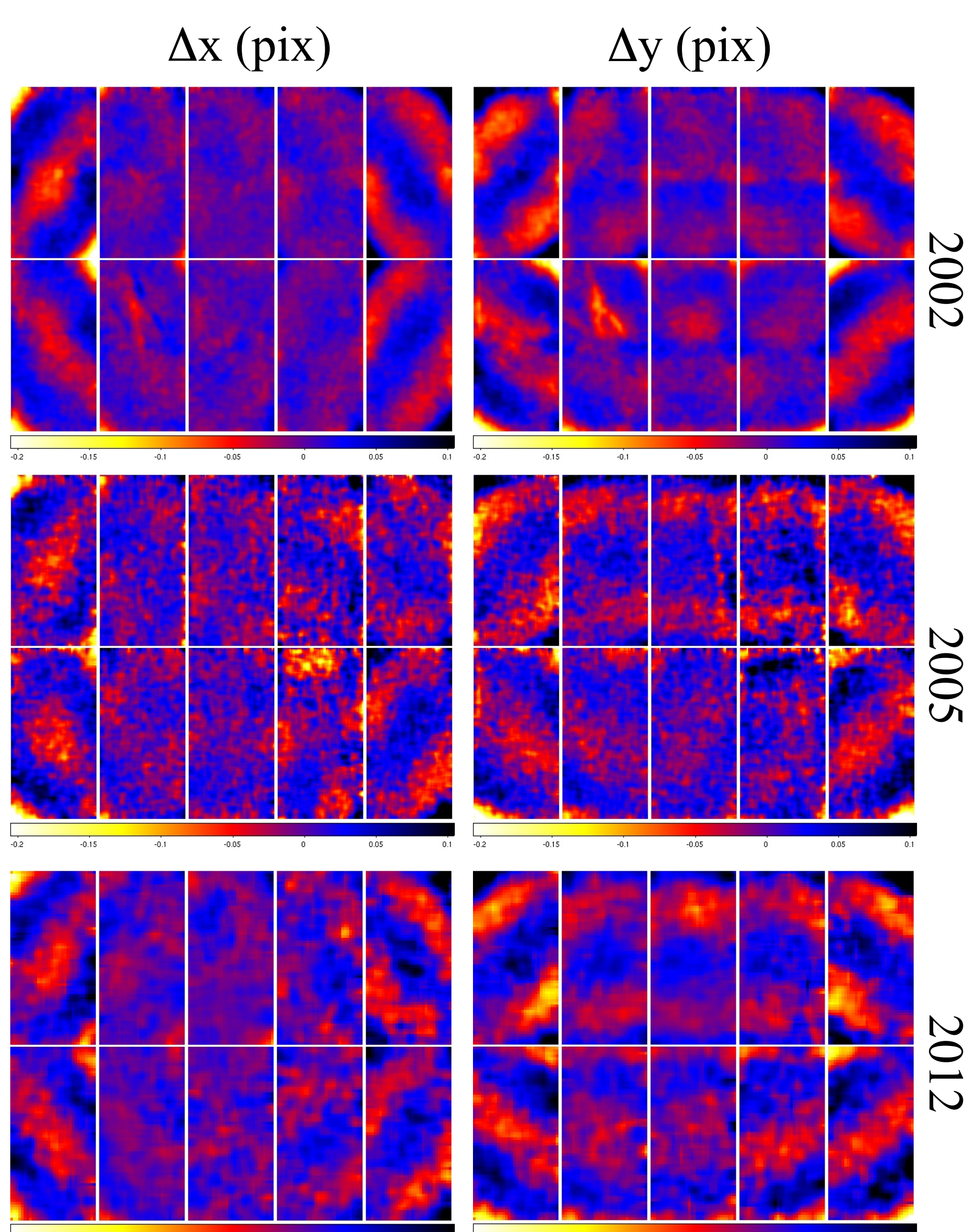


The 2002-epoch dither pattern of SuprimeCam pointings in the field of NGC 2419, shown as blue crosses. By comparison, the Sextans dither pattern (in red) covered a larger area, with fewer dithers at each large offset.



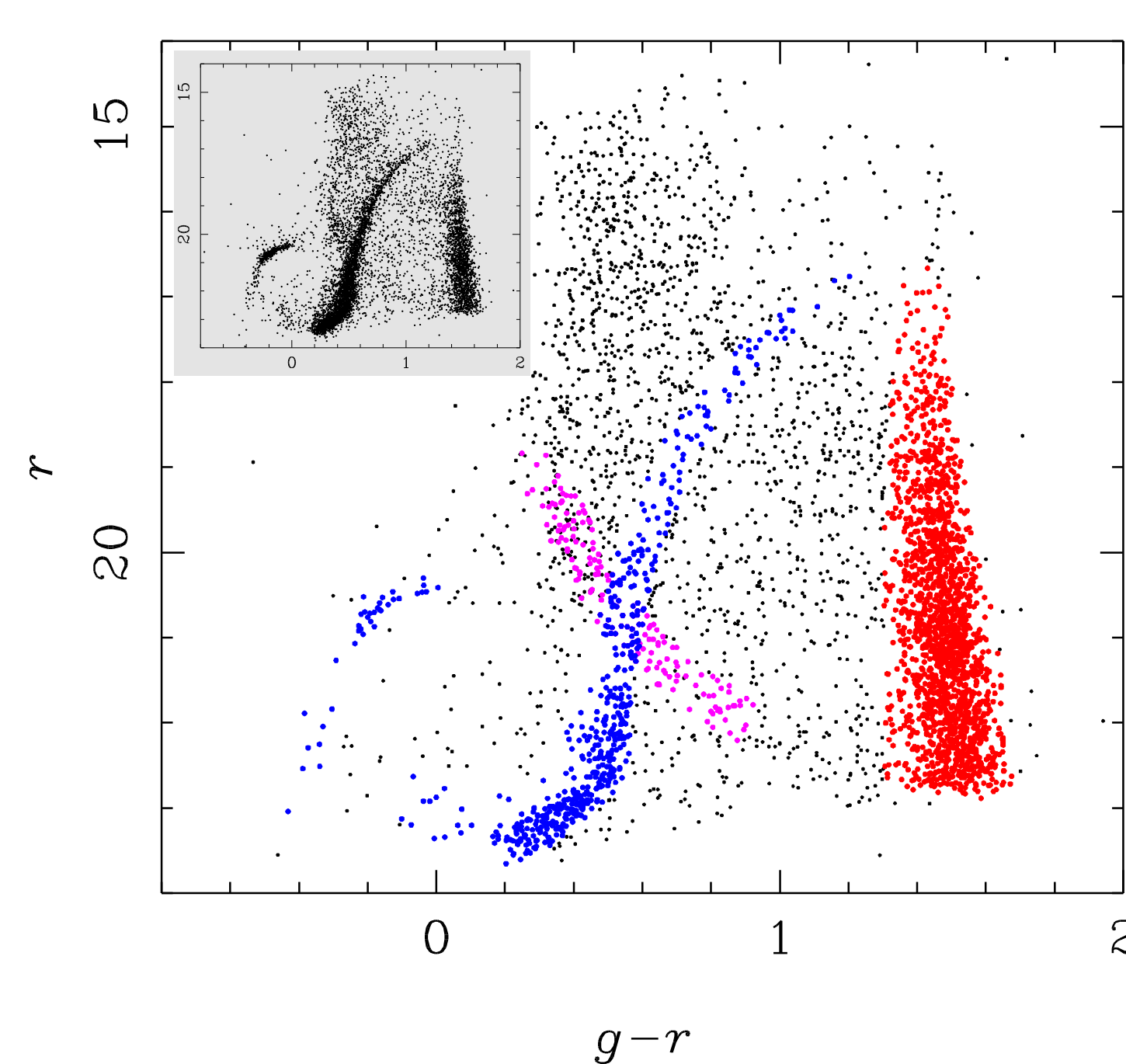
A SuprimeCam exposure (V filter, 180 s) in the field of NGC 2419. The cluster is located in the upper-row, central chip. SuprimeCam is a 10-chip (2K×4K) mosaic camera at the prime focus of the Subaru 8-m telescope at Mauna Kea, Hawaii. Pixel scale is 0.2" and field of view is 34'×27'.

Distortion-Correction Maps



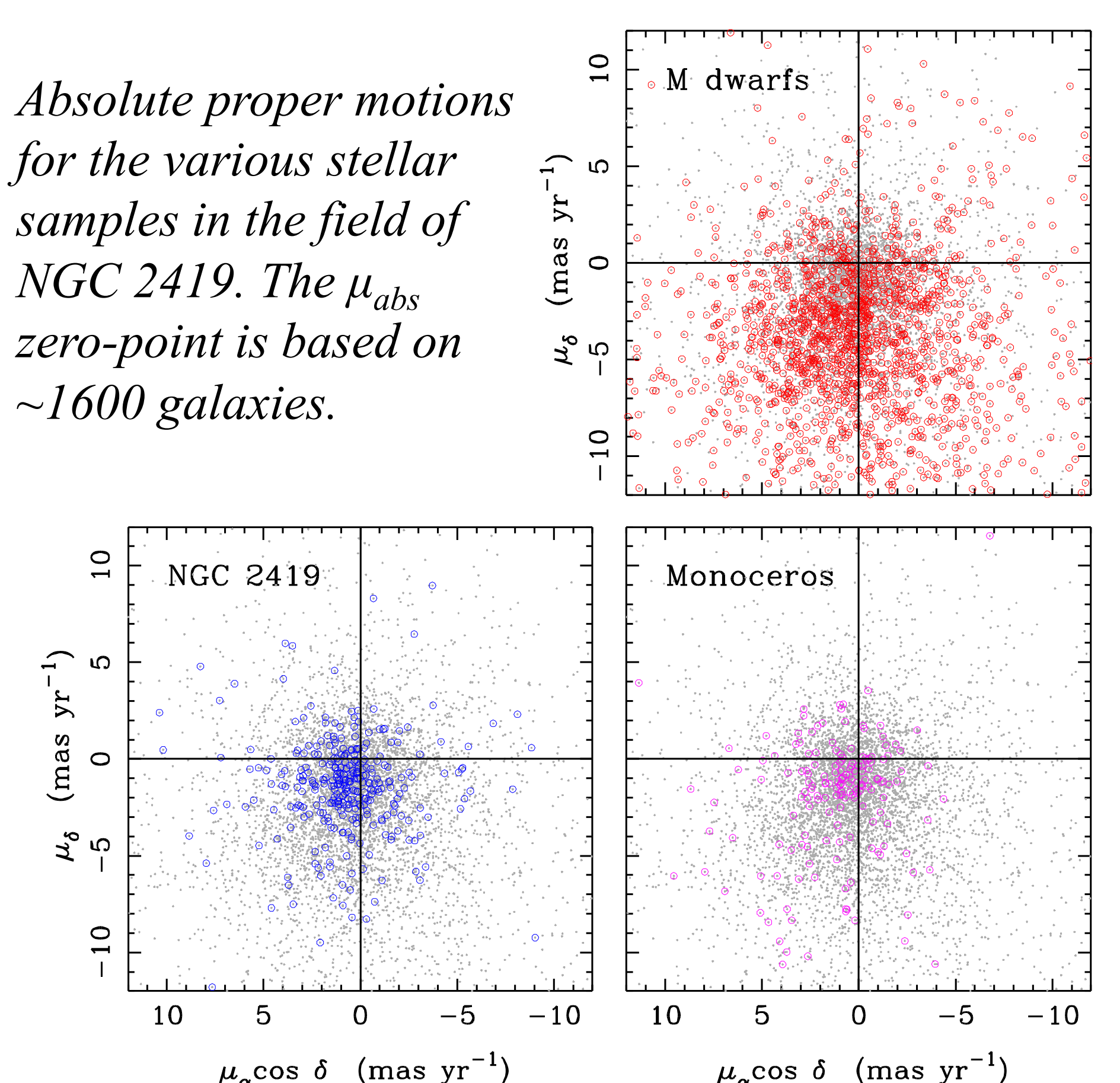
The derived astrometric correction maps, by epoch, of distortions beyond cubic field terms.

Preliminary Results in the Field of NGC 2419



CMD of stars in the field of NGC 2419 from CFHT-based photometry by Carballo-Bello et al. (2015 ApJ 805). The inner 5-arcmin portion of the cluster has been omitted. (The insert shows the full-field CMD.) The cluster, foreground Monoceros structure, and field M dwarfs are as indicated.

Absolute proper motions for the various stellar samples in the field of NGC 2419. The μ_{abs} zero-point is based on ~1600 galaxies.



Though preliminary, this indicates a motion for Monoceros that is Thick-Disk-like, while the velocity of NGC 2419 is unexpectedly large and retrograde.

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